RAMPAC: THE DEPARTMENT OF ENERGY'S WEBSITE FOR INFORMATION ON RADIOACTIVE MATERIAL PACKAGING

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ABSTRACT

Emerging in 1981, the U.S. Department of Energy sponsored development of a mainframe-computer database consisting of information from Certificates of Compliance for radioactive material packages. The Commission directed development of the RAdioactive Material PACkaging database as a tool for assisting those operating under the authority of the U.S. government who needed to ship radioactive materials. For example, an engineer could specify the chemical and physical form of isotopes to be shipped or geometric constraints, etc. and quickly identify candidate packagings. Since that time, the database has expanded greatly and moved to World Wide Web. The RAMPAC website hosting the online database also offers myriad packaging-related information or links to the information elsewhere on the web. Updated regularly and frequently, the website currently consists of ~700 active display pages including nearly a gigabyte of certificate files and other relevant information. In short, RAMPAC has become an all-in-one source for information on shipping containers for radioactive materials. This paper elaborates on the current state of the RAMPAC website and describes plans for its future.

BACKGROUND

In 1981, the young U.S. Department of Energy (DOE) sponsored development of a compendium of information about non-classified radioactive material (RAM) packages certified for transport over public highways. Sandia National Laboratory developed and populated a database of certificate information originally from the Nuclear Regulatory Commission's (NRC's) annual "Orange Book" publication of certificates. The new database management system application, named RAMPAC (RAdioActive Material PACkaging), ran on an IBM 4341 mainframe at the Idaho National Engineering Laboratory.

Prior to 1985, individual DOE field offices issued DOE certificates, and they were not included in the "Orange Book" or the RAMPAC database. After 1985, the database began to accumulate data from individual NRC, DOE and DOT certificates within weeks after issuing, rather than from annual reports. By 1991, the database moved to a Digital Equipment Corporation (DEC) VAX mini-computer cluster at Oak Ridge National Laboratory (ORNL). The RAM-packaging community accessed the database through a DEC VT-100 terminal (or compatible) and a telephone modem (time-shared dial-up connection) with a maximum transmission rate of 2400 baud. By 1994, the packaging community could access the database over the internet via TELNET software running on a PC platform, and execute either canned or ad-hoc queries, but certificates copies were available only via separately-accessed fax system. In early fiscal 1997, DOE headquarters implemented a strategic realignment of information resource management, terminating RAMPAC funding and ORNL's plans to move the database to an internet-based system running from a PC. In April 1997, ORNL shut down RAMPAC and delivered the data files to DOE headquarters.

RAMPAC's DOE sponsor assigned Eagle Research Group, Inc. (ERG), a DOE contractor, the task of developing an internet-based version of RAMPAC. February 28, 1997, ERG purchased the

"rampac.com" domain name, and in September 1997, the website went live, offering the public a controlled view of the database and other packaging-relevant information. In 1999, RAMPAC began offering certificate files in Adobe® Portable Document Format (PDF).

RAMPAC NOW

DOE's Packaging Certification Program (PCP) is the current sponsor of the RAMPAC website and recently directed the change of internet domains from "rampac.com" to "rampac.energy.gov." Along with the domain change, the website relocated physically and now runs from a virtual Windows® server at the Savannah River National Laboratory. The site consists of over 200 linked HTML pages, over 500 linked PDF files and assorted links to other sources of packaging-relevant information. However, the RAMPAC Certificate Database remains the heart of the website, storing information for over 5000 radioactive material packagings (shipping containers). Included are selected data from NRC Certificates of Compliance, from DOE Certificates of Compliance, from DOT Competent Authority Certifications for international shipments to and from the United States (based on either NRC or DOE certificates or based on foreign government certificates) and from DOT special form Certificates of Competent Authority for both domestic and international shipments. Typically, a certificate contains, among other information, a brief description of the major components of the packaging (often including overall dimensions, cavity size, and gross weight), a detailed description of the authorized contents, and any special operating restrictions or conditions of approval.

The structural organization of RAMPAC website is shallow, requiring no more than two clicks from a patron to arrive at a link to the information sought. And, in the age of Web 2.0 and website Flash,® RAMPAC purposely maintains a "lowest common denominator" approach to page layout specifically for the convenience of field personnel. The dearth of bandwidth-consuming "glitz" features minimizes the delay in downloading pages via wireless or dial-up connections and permits resizing pages as necessary to minimize side scrolling on hand-held devices.

Arriving at rampac.energy.com, the RAMPAC patron sees by a brief welcome and notice of security monitoring. After proceeding past the security warning page, the RAMPAC Home page serves as a portal to the rest of the website.

RAMPAC Home Page

This page consists of five segments including 1) the home page title, 2) links to top-priority issues or breaking news items, 3) an invitation to register for update notices by email and links to database or webpage search features, 4) a listing of links to frequently viewed webpages and 5) links to website sponsors.

For example, at the time of this writing, the top-priority issue is permanent expiration of some commonly used DOT, DOE and NRC packagings, This concern is emphasized by a clock counting down to October 1, 2008, in conjunction with a link to DOE's position on the matter.

Moving below the top-priority segment, the patron can register to receive email notices, proceed to query the online database or to text-search the site's webpages. Registration is not a means for the DOE to track website users or to restrict access to any part of the website. RAMPAC is open to anyone, as is access to the online certificate database. Rather, registration is a convenience for patrons, whereby they may receive electronic notification of updates to the website. This paper discusses the online database search and the webpage search, each in its own section.

Below this segment, the experienced patron can open specific webpages directly. Links to the most often requested pages appear at the tops of the two-column lists. They are the Certificate Retrieval Page where

patrons can download current certification documents in PDF form and the Docket Status and Statistics page where applicants and regulators alike can review the progress of the certification process. This paper discusses each of the 14 links in its own section in order of statistical popularity.

Webpage Search

Here RAMPAC patrons can locate webpages that contain alphanumeric combinations of text or numbers. A patron enters a string of alphanumeric characters known as the "search term" into the text box provided and clicks on the [Go!] button.

For example, type in a certificate number and (if the number is valid) links to webpages will appear containing every mention of the number. If the certificate is current, a link to the Certificate Retrieval Page will be present. If the certificate is undergoing revision, links will include docket information pages of interest to applicants, including Docket Status, Docket Timelines and Points of Contact pages. In addition, links will include the Registered User Summary, of possible interest to operations folks. Finally, among the links will be the Open Dockets… page presenting information sorted by DOE office. Click on one of the links and the selected page will open in a new tab or window (depending on the configuration of the browser software). Then engage the browser's "Find" feature to locate the specific instances of the certificate number. Improvements planned for the RAMPAC website include overcoming this user-inconvenience by immediately displaying the first instance of the search term, see the RAMPAC FUTURE section.

Note that this search arrangement applies to webpages only and does not include files stored in PDF form. This is intentional because nearly all certificate files consist of images of the text pages and do not include searchable text. Enabling character search of PDF files at this time would at best provide RAMPAC patrons an incomplete and thereby misleading view of the information sought.

However, this may change in the future as technology continues to advance. Currently, certificates are stored in PDF form which supports accompaniment of searchable text corresponding to the image displayed on a computer screen. Unfortunately, the PDF file must have incorporated the character recognition feature at the time of document scanning, and the operator must have corrected all character-recognition errors manually. Any recognition error not corrected or "corrected" inaccurately constitutes a string of text cannot be found by searching for the correctly spelled word. One solution is to generate the PDF file directly from the word-processing software used to write the certificate, and thereby avoid the intermediate step of printing and scanning the pages. Even so, approval signatures are not normally part of a word-processing file, and hence, approvals are likely to remain parts of scanned-page images as described above.

Online Database

Since RAMPAC patrons cannot search certificates directly, a database of relevant parameters remains necessary. The RAMPAC Online Database Search page offers a means of locating certificates that meet specified search criteria. At this time the search criteria consist of three general categories: administrative certificate information, authorized package contents or package dimensions/weights.

Under administrative certificate information, searchable parameters (database fields) include package ID number, package model name (both as stated on the certificate), agency (party that issued the certificate), package type (e.g., box, drum, encapsulated source, etc.), whether DOE is a registered user, ranges of certificate issue and expiration dates. To the extent practical, each search field provides a pull-down menu of choices.

Under authorized package contents, searchable parameters include general contents (e.g., fissile uranium, transuranics, irradiated fuel, etc.), chemical composition (e.g., radionuclides), physical form (solid, liquid, gas or more specific details like fuel elements, pellets, powder, metals, etc.), content limits and limit units (e.g., a number of watts, a number of grams, a weight percent enrichment, etc.). Again, to the extent practical, each search field provides a pull-down menu of choices. However, the number of possible radioisotopes or their chemical forms makes a pull-down menu for this field impractical, and RAMPAC patrons must type-in this search term directly. For example, a typed entry of "U-235" or "Pu-239" will target every certificate that specifies this isotope among the authorized contents. An entry of "actinide" or "byproduct" will target every certificate that specifies radionuclides by this grouping. Such generic specifications can arise from a certificate writer's view that quantities of individual isotopes are minimally hazardous and that content limits fit a simpler accounting of the low number of total Curies present. A limited amount of inconsistency in this regard results from the fact that three different agencies write certificates at different times using different people of different backgrounds.

Under package dimensions/weights, searchable parameters include ranges of overall external dimensions, payload cavity dimensions and both payload and loaded package weights. The weights criteria include the options of "less than," "equal to" or "greater than" the search value provided.

Database "hits" meet all specified search criteria; hence, default limits are set very broadly to avoid missing any candidate certificates. To reduce to volume of "hits," narrow the limits of previous criteria. RAMPAC patrons may choose to list search results tersely, with minimum detail, moderate detail or select comprehensive delivery of virtually every parameter stored in the database.

Further, database content is not static but updated as frequently as the PCP issues DOE certificates or receives NRC or DOT certificates, often daily.

Certificate Retrieval Page

From the Certificate Retrieval Page, RAMPAC patrons may view or download certificate files in PDF format (only). The page consists of three tables of certificate data, one each for the DOE, the NRC and the DOT. Each table includes links to certificate files (ordered numerically by certificate number), the corresponding package ID numbers, certificate revision numbers, package model numbers (or names) and expiration dates. If a certificate expires within the next twelve months, the table alerts users to this fact by flagging the expiration date with a red background. In addition, the table lists NRC certificates meeting NRC's conditions for Timely Renewal that remain valid after the stated expiration date. The Certificate Retrieval Page receives updates along with the online database, often daily.

Docket Status and Statistics

The Docket Status and Statistics page offers links to six pages of interest to applicants or regulatory authorities. As introduced in the ***Webpage Search*** section, they include 1) docket status, 2) docket timelines, 3) docket statistics, 4) open dockets sorted by DOE program office and field elements, 5) points of contact for docket activities and 6) registered users of DOE and NRC certificates where DOE is either the certificate holder or a registered user.

Links 1) and 2) should interest applicants involved in DOE's certification process. The Docket Status page displays a set of summary information for each docket (each package-certification review job) including the last action completed, when and by which party (applicant, PCP, NRC or DOT), along with which party has the next action and when it is expected. The Docket Timelines page displays for each docket a chronology of actions planned versus actual achievement for both applicant and PCP along with comments elaborating every action. The data serve to keep everyone informed as the certification-review process progresses. Both applicant and PCP know clearly "in whose court the ball resides."

Links 3) and 4) should interest primarily DOE program offices. The Docket Statistics page displays a breakdown of various aspects of currently open Type B dockets, a compilation by month of the current fiscal year's docket activities and a compilation by year of docket activities spanning the life of what is now the DOE PCP (1986 to present). The Open Dockets… page displays a "snapshot" of all open docket activities, connecting DOE field office requesting service (for the applicant) with the DOE program office supporting the certification review.

The Points of Contact page (link 5) above) should interest anyone with questions about packagings currently in service to the DOE or packagings under DOE-certification review. The page presents five tables of contact information organized according to the relationship of DOE to the certificate, including open DOE dockets, DOE certificates, NRC certificates with DOE as "Certificate Holder" and as "Registered User" and DOT certificates.

The Registered User Summary page (link 6) above) is described in the ***Guidance and Requirements…*** section below, and focuses on providing information for DOE contractors. The Docket Status and Statistics page offers the same link for the convenience of DOE Program personnel.

All docket-related data receive updates twice per month, on or about the 1st and the 15th, as announced on the RAMPAC Home page.

Packaging Certification News

The Packaging Certification News page presents seven headings, including Training Courses, Meetings and Conferences, and news from DOE, NRC, DOT and IAEA. Here RAMPAC patrons can read about upcoming professional events (e.g., INMM 49th Annual Meeting), download or link to sponsors' websites for additional information. The DOE News segment lists and provides links to recent DOE documents (e.g., the recently revised *Packaging Review Guide for Reviewing Safety Analysis Reports for Packagings* (SARPs)), to new websites (e.g., the National Nuclear Security Administration's new packaging information website, OTAC.doeal.gov) or to people (via email) for additional information. The NRC segment provides links to recent Regulatory Issue Summaries, Information Notices and various other rulings of interest to the packaging community. The DOT segment offers links to recent information sent to the DOE to resolve various regulatory issues. The IAEA segment similarly offers links to issue resolutions but also provides links to IAEA regulatory guides and ongoing programs.

The Packaging Certification News page receives updates as often as new information comes to the attention of DOE's Docket Manager (normally within a day of receipt) as announced on the RAMPAC Home page. Annually, older packaging certification news items move to an archive page, but remain available to RAMPAC patrons.

Requirements for DOE SARPs

The Requirements for DOE SARPs page should interest applicants primarily and provides links to seven sets of requirements information. These include 1) a flowchart of DOE's package certification process, 2) qualifications guidelines for the team writing SARP, 3) DOE's SARP-completeness checklist, 4) guidelines for submitting a SARP for certification review, 5) payment for the review service, and 6) DOE's Packaging Review Guide that leads the work of the regulatory reviewers.

The seventh link is to a white paper describing the current options, requirements and calendar limitations for shipping Type A quantities of *fissile* materials. As of October 1, 2008, the Code of Federal Regulations (CFR) will withdraw the authorization for many "specification" packagings formerly

acceptable for shipment of this material. After this time, nearly all shipments of Type A fissile materials will require a certified Type AF packaging.

The SARP Completeness Checklist (Link 3) above) should be of interest to SARP developers and regulatory reviewers alike as a tool for assisting both parties in determining the complete of a SARP. Revised in 2007, the checklist consolidates regulatory requirements from the CFR along with format and content guidance from Regulatory Guide 7.9 and can serve as a "road map" to the locations (e.g., section, page, and maybe paragraph) within a SARP that address each specific requirement or guidance item. It does not, however, guarantee SARP accuracy nor reduce the need for independent technical review.

Guidance and Requirements for Use of NRC and DOT-IAEA Certificates

The DOE owns and operates its own packagings, but occasionally an existing NRC or DOT packaging can both serve the needs of the DOE complex and conserve resources. In this situation, DOE applies to the NRC or the DOT to become a registered user, or in some cases where NRC has no interest in the sustaining the certificate, a certificate holder. Regardless, DOE requires users of DOE-certified packagings to register with the DOE PCP and recommends this for users of NRC-certified packagings (on behalf of DOE).

This page offers links to eight sets of information for DOE contractors, presenting the bases for these actions and discussing provisions for compliance. Included among these is DOE's user-registration form. The design of the user-friendly Acrobat form supports completion online, including convenient pull-down menus of registrant status, package and certificate data along with a pop-up calendar. However, it must be printed, signed and mailed to the PCP as directed on the form. Registration provides the PCP with a database of packagings and user contacts to facilitate timely user notification of emerging technical or regulatory issues. RAMPAC patrons can link to the Registered User Summary page displaying this information organized by relationship of the certificate to DOE. For example, a prospective user of a specific packaging can identify an experienced user quickly and contact him for discussion.

DOE Directives and Federal Regulations

Recently reorganized and downsized, this page presents segments consisting of links to packaging-related DOE Directives and interpretations, to packaging-relevant portions of the CFR, to the Federal Register and to the DOT Office of Hazardous Materials Safety.

Packaging Body of Knowledge

The Packaging Body of Knowledge page is a recent addition to RAMPAC and presents a wealth of guidance from the DOE, the NRC, the DOT, the IAEA, and offers a collection of white papers on packaging-related topics. In particular, the DOE segment offers links to the DOE Guides for DOE Order 460.1B, to SARP guidance documents and checklists and to interpretations of regulatory jurisdiction issues. The NRC segment provides links to packaging-relevant NUREGs (34), Division 7 Regulatory Guides (all 12), Regulatory Issue Summaries (12), Information Notices (13) and Bulletins (5) and various letters of interpretation. This segment also provides links to corresponding NRC webpages for retrieval of other NRC guidance documents not offered by RAMPAC. The DOT segment offers links to various DOT interpretation letters from 1990 through 2008, to DOT's Radioactive Material Regulations Review and to its website of *Significant DOT Guidance Documents*. The IAEA segment lists links to packaging-related technical documents and to the IAEA website for additional information.

White papers compare ISO-9001 and ANSI/ASME NQA-1 quality assurance standards and describe the potential for eutectic failure of 3013 cans containing plutonium metal. The growing compendium will receive additional packaging-relevant white papers as they become available.

Frequently Asked Questions
This set of questions and answers is currently part of the Packaging Body of Knowledge page. The new RAMPAC feature will continue to expand as the Docket Manager receives new questions.

Safety Evaluation Reports for DOE-Certified Packages
From this page RAMPAC patrons may view or download Safety Evaluation Reports (SERs) for active DOE-certified packages. An SER describes the results of the technical review and associated confirmatory analyses carried out to verify that an applicant's package design (documented in a SARP) meets regulatory requirements. The DOE-SER files are not limited to the latest revision, and again, are available in PDF format only (unless omitted because of classified content).

DOT Special Permits
The DOT Special Permits page offers links to a table of currently active Special Permits (SPs) held by DOE and to the *Special Permits and Approvals* page of DOT's Office if Hazardous Materials Safety website. From the table of DOE-held SPs, RAMPAC patrons may view or download SP files in PDF format (only). The table lists the SP identification number, expiration date and a brief summary of its purpose. As for normal certificates, expiration dates of SPs arriving within the next twelve months appear in red text to emphasize the fact. The table receives updates as often as SPs (issued or revised) come to the Docket Manager. From the DOT website users can search for SPs by ID number or browse listings of the thousands of current SPs for viewing or downloading.

Non-Certified Packaging
The Non-Certified Packaging page offers links to various DOT 7A Type A and DOT 6M documents. The DOT 7A documents include regulatory compliance guidance, testing methodology, packaging qualification checklist in PDF format and the entire two-volume "White Book" of roughly 300 packagings that have demonstrated compliance with regulatory requirements. In addition, the page offers a link to a table of current users of Type A and Industrial Packagings within the DOD Complex. The table is a compendium of user institution, location, point of contact, packaging identities and sources and associated program data. For example, a prospective user of a specific Type A or industrial packaging can identify an experienced user quickly and contact him for discussion.

The DOT 6M documents include a DOE Certificate of Approval for plutonium metal and supporting references and a review of 6M safety features applicable to DOE programs – all soon to be of historical interest only (as of October 1, 2008).

SCALE Newsletter
SCALE (Standardized Computer Analyses for Licensing Evaluation), maintained by Oak Ridge National Laboratory, is a well established set of tools focused on shielding and nuclear criticality safety. The SCALE newsletter link takes RAMPAC patrons directly to the SCALE website where issues of the semi-annual newsletter are available in electronic form as far back as 1994.

Package Decertification Checklist
The Package Decertification Checklist page should interest both packaging hardware stewards and regulatory authorities. The short page describes the conditions under which decertification is appropriate and lists the steps that must be carried out to complete the action.

PCP Support Websites
This page presents links to relevant websites from four the national laboratories and a DOE contractor that support the PCP. The laboratories are Argonne near Chicago, Ill, Lawrence Livermore near

Pleasanton, CA, Oak Ridge near Knoxville, TN and Savannah River, near Aiken SC. The contractor is Eagle Research Group, with an office in Germantown, MD.

RAMPAC FUTURE

RAMPAC has served the packaging community well for decades, but improvements are always in order. Planned for the website are the following actions.

- Expand the Packaging Body of Knowledge page with a compendium of relevant Lessons Learned studies.
- Develop and incorporate a glossary of terminology unique to the DOE PCP.
- Improve the site search system to display vignettes of the search "hits" highlighting the search term.
- Improve the coding of the online database search feature to reduce false "hits" driven by the absence of certain numerical data in some certificates.

CONCLUSIONS

Over the life of the RAMPAC database, the timeliness of the certificate data it stores has progressed from annual report sources to the immediacy of electronic communication with updates often daily. Similarly, the availability of certificate copies has progressed from paper mailings to time-shared fax retrieval to PDF files on-demand.

Since 1997, the RAMPAC website has served the DOE packaging community well as an all-in-one resource, and the online database remains the only searchable entity containing packaging certificate data from all three federal authorities. In recent years, reorganization and expansion of the website has provided more useful support for packaging operations and has compiled a growing body of packaging knowledge and wisdom. In addition, the RAMPAC website has received statements of gratitude from other U.S. regulatory agencies for providing them with a source of up-to-date information. Finally, comments on any part of the website are always welcome (best received via email links to the Docket Manager).

REFERENCES

A. K. Tyron-Hopko, *"User-friendly" Database of Certified Materials*, Transactions of the American Nuclear Society, Vol./Issue 46, pp. 172-173, 1984

Driscoll, K. L., *Radioactive Materials Packaging (RAMPAC) Database*, Institute of Nuclear Materials Management, 29th Annual Meeting Proceedings, Vol. XVII, pp. 649-651, 1988

S. J. Primeau and M. E. Wangler, *RAMPAC: An Internet-Based Database of Certified Radioactive Material Transport Packages*, American Society of Mechanical Engineers, Pressure Vessels and Piping, Conference Proceedings Vol. 390, pp. 1-6, 1999

S. J. Primeau, *An Update on rampac.com: The Department of Energy's Web-Site for Information on Radioactive Material Packaging*, American Society of Mechanical Engineers, Pressure Vessels and Piping, Conference Proceedings Vol. 483, pp. 47-50, 2004